NEWSLETTER

National Clonal Germplasm Repository
JUNE 1990

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NEW ACCESSIONS

K. Hummer

We have received about 680 exciting new accessions since January 1990. For *Corylus*, we have received 25 cultivars from Italy, Yugoslavia, and Spain. Dr. Shawn Mehlenbacher, Breeder at Oregon State University, assisted us in obtaining this material. We had excellent grafting take (100%) on all cultivars received. This is a tribute to the good condition of the wood and to the excellent grafting skills of Jim Chandler. In *Fragaria* , Dr. Scott Cameron, Plant Physiologist from Washington State University, and his colleagues Drs. Tom Sjulin and Carl Shanks, collected 271 seeds and runners of *Fragaria chiloensis* from Chile for us in January. They collected from more than 16 locations throughout the Chilean coast. Large white fruited Chilean strawberries were obtained. Several breeding programs around the country generously donated material from their collections. Dr. Galletta, USDA/ARS Beltsville, Md, provided 22 advanced MDUS selections along with about 25 other selections and older cultivars. Dr. Tom Davis from the University of New Hampshire, sent 18 selections of *F. vesca* and *F. virginiana*. Dr. Luby will be providing *F. virginiana* selections, from his graduate student, Margaret Stahler's recently completed work. One of my goals is to obtain, if possible, *Fragaria* from every state in our country. *Fragaria* is one North American genus that should be promoted, especially when people suggest that North America is poor in germplasm.

Oregon State Foundation Seed gave us 5 mint selections from the mint certification program. We also received 2 selections from South Africa and 1 from Brazil. About 65 new pear accessions were received. Dr. Richard Bell and Dr David Sugar graciously provided cultivars from their plots in Kearneysville, WV and Medford, OR, respectively. Dr. Douglas Crowe in Nova Scotia provided 8 additional cultivars and Dr. David Hunter sent research wood of Harrow 609, which is soon to be released.

Fragaria chiloensis

The *Ribes* collection continues to actively increase with wild collections from Chile and Mexico and with black currant cultivars from Dr. Adam Dale and Andy Vandenberg, in Ontario. We greatly appreciate the cuttings of 'Amos Black' and 'Baldwin' virus indicators which they provided for our National Plant Germplasm Quarantine Center in Maryland, and for our own testing program. Dr. Reckin also sent red and white currant cultivars from Germany. Dr. Hilde Nybom sent 14 seedlots of native Swedish *Rubus* germplasm from Fredriksal Botanical Garden. Dr. Naruhashi sent 4 oriental seedlots from Japan. Harvey Hall provided *Rubus glaucus* that was collected in Guatemala and Ecuador. In *Vaccinium*, Dr. Nick Vorsa donated 15 selections of a range of native blueberry species and 3 cranberry cultivars. Carolyn DeMoranville sent a number of cranberry cultivars from the Massachusetts Cranberry Experiment Station in East Wareham. We received many rabbiteye blueberries from Max Austin and other cultivars and selections from nurseryman Don Hartmann. Our facility is now nine years old and we remain in the increasing accession phase. I would estimate that our collections are increasing at about 1000 per year. Thanks to everyone for continuing to broaden our temperate fruit and nut germplasm base.

STAFFING CHANGES

In March we hired Mr. Ray Gekosky to fill a Biological Aide position which will assist in the small fruits field and with our physical plant maintenance. Ray comes to us from the Forest Service where he worked for several years. Our secretary, Mickey Hooton, has left us to return to her native state of Idaho. We appreciated the help and assistance that she gave us through her several year stay in Oregon, and wish her the best of luck in her return to Idaho. Until a replacement is recruited, Mr. Ron Riesner will be assisting us at the front desk on a part time basis.

Dr. Francis (Whitey) Lawrence, our valued Germplasm Enhancer and USDA Small Fruit Breeder for many years, retired at the end of May. His horticultural expertise and pleasant demeanor will be missed greatly. He is leaving us in the middle of Strawberry season, but assures us that he will be available for consulting and collaboration. We wish him the best of health and life in his retirement.

NOTES FROM THE SCREENHOUSE

J. Orlowsky

Over the winter we built new benches out of cinder blocks and surplus channel iron for 4 screenhouses. The *Humulus* collection was put up on cinder blocks. We expect benefits that include greater air circulation, improved pot drainage, root pruning so that the plants do not root through the drainage holes in the pots, and decreased potential for infestation by soil inhabiting pests such as root weevils and nematodes.

We have isolated the known virus infected germplasm in one screenhouse to lessen the chance that viruses would be contracted by our healthy plants. In the *Fragaria* and *Rubus* screenhouses we have instituted strict aphid exclusion and control measures to prevent spread of viruses.

The *Rubus* collection has been arranged by local number into main groups based on propagation method (tip layers or cuttings).

The *Mentha* collection was moved from the strawberry screenhouse to provide room for our burgeoning *Fragaria* collection. In the moving process all the mints were repotted and arranged in numerical order. They have responded with tremendous growth this spring and look very good.

We have changed the focus of pear scionwood collection from the screenhouse to the field. Since pear viruses are not insect transmitted, we will use scionwood from the field for distribution. Screenhouse trees have never provided adequate amounts of scionwood. In the future, all cold hardy pears will be established in the field and removed from the screenhouse.

A computer was recently installed in the headhouse and linked to our new network. Instant access to inventory will be a great timesaver.

I have learned a lot in the 10 months since I have become greenhouse manager. I would be remiss without thanking Joe Snead and Jim Chandler for their patience, direction and help.

MENTHA COLLECTION

H. Chambers

Recently, the major effort on the *Mentha* collection has been to determine the best techniques to obtain chromosome counts from dividing root-tip cells. Our aim is to verify the published chromosome counts as well as to obtain a count from each species or variety in the collection. By combining and/or modifying the pretreatment, fixation, staining and

mounting techniques of Harley, Haunold and others, we are now getting well-stained, dividing cells consistently.

In late winter, the entire screenhouse collection was repotted and moved to new benches. The improved air circulation will discourage mildew and other fungus problems.

We received seed collections of 7 species of *Pycnanthemum* from Jon Hamer at Ohio University, to replaced species lost in the 1989 freeze. We are growing extra plants of 6 species so that we can provide 300 grams of dried plant material of each to the National Cancer Institute for their drug testing program. If these show promise, we will grow material of the other species in 1991. There is also increased interest in plants that produce high concentrations of pulegone, a monoterpene component of the oil of many species of the mint family. This shows promise as an insect repellent and some *Pycnanthemum* species show high concentrations (up to 80%). We will be sending vegetative material and seeds to the Germplasm Services Laboratory for evaluation.

INTEGRATED PEST MANAGEMENT
B. Doerner

Integrated pest management (IPM) is a strategy of pest containment which seeks to maximize natural control forces such as predators and parasites, and utilize other tactics only as needed and with a minimum of environmental disturbance. The germplasm repository practices IPM whenever feasible. This year we are beginning to see positive results from these efforts.

Several control tactics have been implemented over the past 6 months in the greenhouses and screenhouses. These tactics include: vaccumning all leaves and debris, application of dormant oil sprays, removal of weeds by hand, and elevation of plants from the ground to benches. Moving the plants onto benches has greatly reduced the weed problems. Now weeds can easily be removed from the pots by hand. The weeds under the benches can be controlled very effectively by broadcasting monobor chlorate granules without damaging the plant collections.

We have established a quarantine area for examining/treating all plants entering or leaving the greenhouses. This practice reduces the number of pests being introduced into the greenhouses and screenhouses. Plants which are infested with pests can be brought into this quarantine room for individualized treatment. This has created a safer environment for people working in the greenhouses by reducing the amount of pesticides applied in the greenhouses.

We have developed an IPM program for the pear collection and will use this model for developing pest management strategies for the other genera. Predatory mites (family Phytoseiidae) have been released in the pear screenhouse for control of phytophagous mites (family Tetranychidae). We continue to use a day-degree phenology model and selective materials (soft chemicals) for control of codling moth in the pear orchard. We had good results last year using this program and will implement a similar program for filberts this year.

VACCINIUM/RIBES SCREENHOUSE
J. Chandler

We are taking cuttings of *Ribes* and *Vaccinium* in the screenhouse to repropagate the older plants. Some plants are 9 years old, quite woody, and not very vigorous. Softwood cuttings of *Ribes* are rooted in perlite, and *Vaccinium* cuttings are rooted in fir bark dust, as recommended by J. Ballington. We are also checking plants to confirm identities.

TISSUE CULTURE AND CRYOPRESERVATION
B. Reed and C. Paynter

The tissue culture lab is currently storing over 1000 accessions at 4°C and is actively adding to the cold storage collections. The addition of spring explants of *Mentha, Fragaria, Vaccinium, Ribes* and *Humulus* will greatly increase the cold storage collection by the end of the summer. The addition of 80 Fragaria accessions from Beltsville has also increased the number of cold stored plants in that genus. Collecting from screenhouse collections this spring should increase our holdings to include nearly all of the *Fragaria*. All of the cultivars of Humulus have been initiated into culture and will be added to the cold storage collection in the near future. The in vitro *Ribes* collection is nearly complete but study of the growth media for recalcitrant accessions is continuing.

Large numbers of requests for in vitro material continue to arrive. We respond to orders with the accessions which we have available. Due to the large volume of requests we do not keep back orders for accessions not currently in vitro. Many of the most popular cultivars are also the more difficult or slow to culture but will be sent as they multiply.

Work on alternative storage temperatures and media is in progress. These procedures are especially needed for *Rubus* which is highly variable in response to cold storage. Those accessions which do not respond well to 4°C storage will be grown under a variety of conditions in order to determine a suitable slow growth method.

Cryopreservation efforts continue to focus on *Rubus*. Screening of accessions for their response to cryopreservation has shown fairly wide variability. Efforts will focus on decreasing the variability to produce a standard technique for storage in liquid nitrogen. Additional studies are also in progress to increase our understanding of the effects of cryopreservation on meristems. The histology of the recovery process is being studied by Dr. Patricia Buckley who is currently working in the lab. Recovering meristems will be examined to determine the source and quality of new growth.

GERMPLASM ENHANCEMENT
F. Lawrence

Strawberry selection ORUS 4930 was released as 'Redcrest'. This cultivar is easily capped and has excellent freezing qualities. Strawberry selection ORUS 4688 is in grower trial for potential release in 1991.

Tissue cultured plants of the thorny cv 'Kotata' were irradiated with Co_{60} and failed to show any thornless mutant types although a few small thornless areas, probably of a periclinal chimera nature, were noted on a few canes.

Root pieces of the raspberry cv Willamette were treated with colchicine in an effort to produce a 4X clone of this cv for use in breeding; and several selections from red raspberry seedlings populations exhibiting polyploid phenotypes have been saved for evaluations.

GRIN/DATABASE MANAGEMENT
D. M. Gerten

Local database management has taken a great leap forward at NCGR-Corvallis thanks to the installation of our new Local Area Network. The Novell ELS System II network supports seven users located throughout the facility, using a DA Turbo/386 computer with a 150 Mg hard drive as the file server.

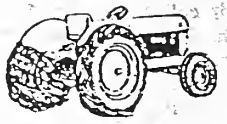
Database management is now done with FoxPro (LAN version), a dBASE language database management program. This upgrades us from dBASE III+. Word processing, spreadsheet, and graphics software are also available to network users. NCGR staffers are adjusting to the changes with the usual gusto and new network uses and applications are constantly being discovered and revised.

Data uploading to GRIN continues on a quarterly basis. Adjustments are being made to accommodate recent GRIN accession record changes, particularly concerning the revised origin definitions and source-history narratives. This work should be finished by late summer.

This year all *Rubus* and Minor Genera accession data was updated and reloaded to GRIN. New accession records were loaded for *Humulus*. Mint data will be loaded shortly.

We are collecting more observation information this growing season on pears, hazelnuts and small fruits. Once entered to computer, the data will be loaded to GRIN. We are considering contracting data entry for a voluminous backlog of pear observation information.

FIELD GROWINGS ON
J. Snead



Spring came to Corvallis early and without much hesitation this year. We had unseasonably warm weather and long periods with little precipitation. The weather condensed the spring field work into a short time span with few breaks of inclement weather. We had to do some unexpected early irrigation on new transplants and used the irrigation to incorporate fertilizer on some plots. We have just refurbished and installed a weather station in our pear field. With this system we will be able to record air temperature, relative humidity, soil temperature at two depths, precipitation, wind speed, wind direction and solar radiation. This information will be useful to us and other local researchers. We have purchased a software package that will enable us to do insect modeling for our IPM program. We should be able to set up a pear scab predictor in the future also.

Many old trees have been removed from

our *Pyrus* field and replaced with new virus negative trees. We are well on our way to having a virus negative planting. This has also eliminated a backlog of trees in a holding nursery.

Some trees are still showing the effects of the February 89 freeze. Some trees were cut back to the base and many have produced fine new sprouts. Care must be taken not to confuse rootstock sprouts with scion sprouts. Some trees were severely affected by *Pseudomonas syringae* that probably entered through winter damaged branches.

Our new minor genera field is gaining some dimension with the new spring growth. The cranberry plots are also growing nicely. New cranberry accessions are trickling in and many new accessions are expected.

The proposed land purchase for 42 acres is still a pending. An offer has been made and we are waiting for a reply. The land will require improvements before it would be usable. A deer fence and irrigation system will be the first priorities. Additional equipment will also be needed to handle the soil work.

An experimental wildflower, turf plot is in full bloom at this time. Other perimeter field areas will be changed over to enhance their beauty and reduce maintenance.

PEAR VIROID

J. Postman

A viroid is a low molecular weight circular RNA that can be thought of as a small virus that lacks a protein coat. The absence of a protein coat makes detection and characterization of viroids particularly challenging. A protein coat is necessary for the development of serological tests such as the ELISA. A fruit damaging disease of apples known as Apple Scar Skin is now known to be caused by a viroid. Scar Skin is very similar to a disease that has been occasionally observed in several parts of the United States, called Dapple Apple. ARS researcher A. Hadidi has recently developed a cDNA probe to detect Apple Scar Skin Viroid, and has verified that Dapple Apple is caused by the same (or nearly identical) viroid. Chinese researchers have demonstrated that a disease of pears in China, called Pear Rusty Skin is also caused by the Apple Scar Skin viroid. Several Chinese pears that have been imported by the Corvallis repository, and are still in quarantine in Beltsville, have tested positive using the Apple Scar Skin cDNA probe. Viroid infected plants present an additional dilemma since viroids do not respond to conventional virus therapy. Heat therapy, in fact, tends to increase, rather than decrease the replication and titer of these entities. Cold therapy, followed by meristem culture has had some limited success with other viroid infected crops, and will be worth attempting with our Apple Scar Skin infected pears from China.

MAINTAINING

R. Gekosky

As a new biological aid with the repository, I am assigned to field work and to physical plant maintenance. In the field, I've been assisting Joe Snead with various cultural aspects of the *Pyrus* and small fruit collections. Some of the work has included *Pyrus* and *Vaccinium* pruning, *Rubus* trellising, *Fragaria* hoeing and fertilizing, the transplantation of our nursery stock, and mowing of all the fields.

About half of my time is occupied with physical plant maintenance. Regular routine maintenance is required on environmental controls for the office and greenhouse complex. Greenhouse swamp coolers have been serviced and I have attended to broken water pipes in the lab, and some minor power outages. We have improved the doors on the *Fragaria* and *Rubus* houses by having the inner doors open inward. This allows a minimum of outside exposure during entry, and along with a fan system, will decrease the chances of insect infestations. Each new maintenance project can have unusual and unexpected circumstances, which creates some interesting and challenging work.

STRAWBERRY JUNE YELLOWS

J. Postman

Research interest in the June Yellows has intensified in the United Kingdom since the strawberry disorder has been observed on one of their most important cultivars, Cambridge Favorite. June yellows causes a seasonal variegation and eventual degeneration of strawberry plants, and is transmitted by both seed and pollen to progeny of affected plants. Yields are reduced dramatically as the disorder becomes more severe in succeeding years. The symptoms may not be apparent in a new cultivar for many years, and when variegation begins to develop, it mysteriously develops at about the same time wherever the cultivar is grown around the world. Some cultivars have been grown for more than 10 years before June Yellows became apparent. Nearly all June Yellows affected plants can be traced back to a few cultivars in their pedigrees. These include Howard 17 (Premier), Blakemore, Climax (Auchincruive Climax), and more recently Cambridge Favorite.

All attempts to find a pathogen associated with June Yellows have been unsuccessful. In a recent newsletter from the ISHS working group on small fruit viruses, A.T. Jones and coworkers in Scotland report on the occurrence of microscopic features commonly associated with virus infected plants, but like researchers before them, they failed to find any virus-like particles. They also failed to detect viroid-like RNA using electrophoretic tests. Attempts to eliminate June Yellows through conventional virus therapy methods have been unsuccessful. Most researchers currently believe that June Yellows is a genetic mutation, and inheritance patterns suggest that cytoplasmic rather than nuclear DNA is involved. June Yellows remains a problem for strawberry breeders. It is difficult to predict when the disorder will appear, or if a parent is a symptomless carrier. Currently, the only way to determine whether a clone is carrying June Yellows is by progeny testing, ie. selfing the candidate plant and checking for variegation in the progeny. Of the almost 450 *Fragaria* clones in the repository collection, typical June Yellows symptoms have only been documented in 3 clones (Tufts, Tyee, CA 39.117-4), and the "white streak" form in 1 clone (Vermillion). All of these clones originated from meristems and are free of known viruses. A review of the June Yellows literature was recently published by J. d'A. Hughes in Plant Pathology (1989 38:146-160).

YELLOWJACKETS POLLINATING RED HUCKELBERRIES?

B. Doerner and K. Hummer

On April 3, while taking bloom data in the Vaccinium field an interesting observation was made. Several large wasps were seen foraging on *Vaccinium parvifolium*. Upon closer examination we saw that these wasps were only visiting flowers on *V. parvifolium* although other *Vaccinium* were blooming. Honey bees, bumble bees, and various flies frequently visited the highbush *V. corymbosum* cultivars, but these insects did not appear interested in the less sweet, less conspicuous *V. parvifolium* flowers. Some of the wasps were collected and examined under a dissecting scope. The wasps were identified as aerial yellowjacket queens, *Dolichovespula arenaria* (Fab.) family Vespidae. We were unaware of yellow jackets as pollinators for fruit crops.

Yellowjackets are divided into two groups, the ground-nesting *Vespula spp.* and the aerial-nesting *Dolichovespula spp.* Yellowjackets are social and the colony consists of three casts, the queen, workers (sterile females), and males. Only the queen overwinters, so each spring the queens must construct a nest and start a new colony of workers. This is a formidable task in which the queen single handedly collects bits and pieces of wood from nearby fence posts or barns and chew this into a papery material suitable for nest construction. Very often she must do so under cool rainy conditions early in the spring so that the colony can be established. After construction of the nest, the queen raises her first brood. She provides a constant source of food (mostly chewed up insects) for the developing larvae. As a result she must forage constantly not only for insects but for nectar to sustain her energy. These wasps are covered with dense hair on the face and body. Perhaps in the course of visiting the *V. parvifolium* flowers in search of nectar, they may actually be transferring pollen from one flower to another? We will continue these observations in native plants and in future seasons.

Curators Corner

K. Hummer

As the new decade begins and NCGR-Corvallis is approaching its first decade of existence, the time seems appropriate to reflect on the status of temperate fruit and nut germplasm preservation. The long time cry of American pomologists has been answered: the US now has a clonal germplasm repository system, complete with 9 locations, curators for major crops, and trees, shrubs, and plants growing in field, screenhouse, and culture vessels. The hard political push of many

researchers for more than 20 years has become reality. For those of us into whose hands this valuable germplasm has been entrusted, we take on this responsibility seriously and vigorously, looking towards the many lifetimes of evaluation and research yet to be done. Many countries around the world are watching closely to see how our clonal repository system is working. A decade is short considering establishment time for tree crops. We clonal repositories remain in an active acquisition phase although evaluation has begun. New plant management concepts including local area networking, barcoding, integrated pest management, in vitro thermotherapy, and meristem cryopreservation will continue to bring challenges to germplasm storage and maintenance. I am personally pleased with the excellent staff we have on board to tackle this mission.

Although we are assigned to maintenance of clonal germplasm as plants, we are coming to realize the importance of seed management to a clonal repository. We have begun testing germination percentages, determining germination rules, and generating seedling representatives of wild species and relatives of our major crops. We have generated the following extra seedlings from our trials and would be happy to provide these to interested requesters. Our 1990 catalog is now available. We look forward to hearing from you soon concerning germplasm issues.

EXTRA SEEDLINGS AND NUMBER AVAILABLE

AMELANCHIER

A. alnifolia (57), A. alnifolia cusickii (22), A. alnifolia cv. "Smoky" (74), A. alnifolia selection #129 (14), A. asiatica (7), A. utahensis (8).

CYDONIA OBLONGA

"Akhtubinskaya" (19), "Krukovskaya" (18), "Maslenka Rannaya" (Maslenka Early) (18), "Skorospelka" early maturity (19), "Teplovskaya" (18)

PYRUS

P. betulifolia (15), P. koshinskyi (15), P. pashia (38).

RIBES

R. cynosbati (41), R. maximowiczianum (13), R. niveum (6), R. orientale (51), R. orientale (POSSIBLE 4X) (41), R. pauciflorum (5).

RUBUS

R. ellipticus (18), R. fraxinifolius (19), R. hoffmeisterianus (14), R. innominatus (17), R. sanctus [annatolicus] [fruticosus] (53), R. tephrodes (29), R. tephrodes var. ampliflorus (12).

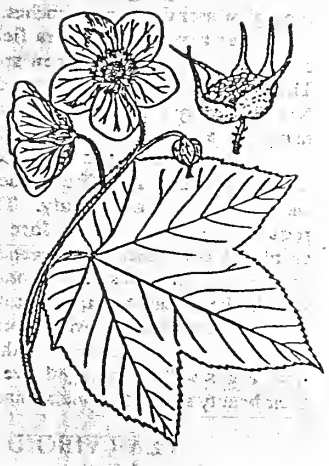
SAMBUCUS

S. cerulea (10), S. pubens (16), S. pubens v. xanthocarpa (18), S. racemosa (14), S. racemosa v. melanocarpa (26), S. sieboldiana v. Tarmiquelii (5), S. wightiana (25).

SORBUS

Luther Burbank Edible Sorbus Seedling (7), S. aria (9), S. aucuparia (12), S. cashmiriana (11), S. decora (10), S. discolor (5), S. folgneri (7), S. huphensis (9), S. koehneana (9), S. serotina (10).

Rubus parviflorus



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